HOSPITAL SHARED SERVICES

IPM Procedure for Pneumatic Tourniquets (Major)

		Interval	Time Required
Last Revised: April 14, 1991	Major:	12 months	Hours
Author: HOSPITAL SHARED SERVICES	Minor:		Hours

DESCRIPTION

HSS PROCEDURE #: B-1010
APPLICABLE TO: Tourniquets, Pneumatic [14-074]
ALSO CALLED: Surgical tourniquets, automatic tourniquets, arterial tourniquets
COMMONLY USED IN: Operating rooms
SCOPE: Applies to pneumatic tourniquets used during limb surgery; does not apply to automatic rotating tourniquets

SPECIAL PRECAUTIONS

Tourniquets inflated with oxygen or nitrous oxide present a fire risk.
TOURNIQUETS SHOULD NEVER BE INFLATED WITH OXYGEN OR NITROUS OXIDE.

TEST APPARATUS REQUIRED

Leakage Current Meter/Safety Analy	Stopwatch or Watch with Second Hand
Ground Resistance Ohmmeter	Hoses, T Fittings, and Adapters
Pressure Meter, $1,000 mm Hg	Sphygmo Squeeze Bulb w/Bleed Valve

SUPPLIES REQUIRED

Cylindrical Object to Simulate Arm

QUALITATIVE TASKS

CHASSIS/HOUSING: Examine the exterior of the unit for cleanliness and general physical condition. Be sure that plastic housings are intact, that all hardware is present and tight, and that there are no signs of spilled liquids or other serious abuse.

MOUNT/FASTENERS: If the device is mounted on a stand or a cart, examine the condition of the mount.

CASTERS/BRAKES: If the device moves on casters, check their condition. Look for accumulations of lint and thread around the casters, and be sure that they turn and swivel, as appropriate. Check the operation of brakes and swivel locks, if the unit is so equipped.

LINE CORD: Inspect the cord for signs of damage. If it is damaged, replace the entire cord or, if the damage is near one end, cut out the defective portion. Be sure to wire a new power cord or plug observing correct polarity.

STRAIN RELIEFS: Examine the strain reliefs at both ends of the line cord. Be sure that they hold the cord securely.

CIRCUIT BREAKER/FUSE: If the device has a switch-type circuit breaker, check that it moves freely. If the device is protected by an external fuse, verify that the fuse type is labeled and that all fuses and spares are the proper current rating and type. If no spare fuse is provided, consider attaching a fuse clip and a spare fuse, particularly for high-risk devices.

TUBES/HOSES: Check the condition of all tubing and hoses. Be sure that they are not stretched, cracked, kinked, or dirty. If the device has hose barbs, ensure that tubing/hoses fit tightly and are not stretched at these sites. Because serious consequences can result from sudden cuff depressurization, replace any questionable hoses.

FITTINGS/CONNECTORS: Examine all fittings and connectors for general condition. Gas fittings should lock tightly and should not leak. If keyed connectors (e.g., pin-indexed gas connectors) are used, make sure that no pins are missing and that the keying is correct. Gas source connectors should NOT be compatible with oxygen or nitrous oxide supplies.

CONTROLS/SWITCHES: Before moving any controls or alarm limits, check their positions. If any of them appear inordinate (e.g., a cuff pressure set at maximum), consider the possibility of inappropriate clinical use or of incipient device failure. Examine all controls and switches for physical condition, secure mounting, and

BATTERY/CHARGER: Inspect the physical condition of batteries and battery connectors, if readily accessible. Check operation of battery-operated power-loss alarms, if so equipped. Operate the unit on battery power for a minimum of 15 min to check that the battery is charged and can hold a charge. [The inspection of the controller stability and/or the timer may be carried out simultaneously on battery power to help confirm adequate battery capacity.] Check battery condition by activating the battery-test function, if so equipped. Check the condition of the battery charger and, to the extent possible, confirm that it does, in fact, charge the battery. Be sure that the battery is recharged or charging when the inspection is complete. When it is necessary to replace a battery, label it with the date.

INDICATORS/DISPLAYS: During the course of the inspection, confirm the operation of all lights, indicators, meters, gauges, and visual displays on the unit and the charger (if so equipped). Be sure that all segments of a digital display function and that gauges read zero with no pressure applied.

ALARMS: Where possible, induce alarm conditions (e.g., kinked tube, cuff underpressure and overpressure) to activate audible and visual alarms. Disconnect the cuff to simulate underpressurization, and squeeze the inflated cuff to produce an overpressure. If the unit has an alarm-silence feature, check the method of reset (i.e., manual or automatic) against the manufacturer's specifications.

AUDIBLE SIGNALS: Operate the device to activate any audible signals, including elapsed-time indicators. Confirm appropriate volume, as well as the operation of a volume control, if so equipped. If audible alarms have been silenced or the volume set too low, alert clinical staff to the importance of keeping alarms at the appropriate level.

LABELING: Check that all necessary placards, labels, and instruction cards are present and legible.

PRESSURE CUFFS: Confirm the presence and condition of all cuffs. Verify that fittings lock securely and that the bladders and tubing are not stretched, cracked, kinked, or dirty. The covers should be clean and the fastening mechanisms should operate properly and hold securely. Velcro-type fasteners should be clean, since excessive dirt or lint may affect their ability to fasten securely. Test the cuffs for leaks by wrapping each around a cylindrical object and connecting it to the pressure

PREVENTIVE MAINTENANCE
CLEAN EXTERIOR AND ACCESSORIES: Clean the exterior and acessories, as needed. LUBRICATE: Lubricate per manufacturer's instructions. CALIBRATE: Calibrate per manufacturer's specifications. REPLACE DETERIORATED COMPONENTS: Replace tubing, hoses, cuffs, and batteries, as needed.
QUANTITATIVE TASKS

GROUNDING RESISTANCE: Using an ohmmeter, electrical safety analyzer, or multimeter with good resolution of fractional ohms, measure and record the resistance between the grounding pin of the power cord and exposed (unpainted and not anodized) metal on the chassis.
CRITERION: #0.5 Ω

CHASSIS LEAKAGE CURRENT: Measure chassis leakage current to ground with the grounding conductor of plug-connected equipment temporarily opened. Check the unit while on and off and record the maximum leakage current.
CRITERION: #100 μA

MAXIMUM CUFF PRESSURE: Disconnect the cuff from the tourniquet controller and in its place connect a T fitting attached to the pressure gauge/meter and a squeeze bulb. Adjust the controller for maximum cuff pressure and then attempt to exceed this pressure with the squeeze bulb. Verify that the maximum pressure does not exceed 550 mm Hg, or that it is within 50 mm Hg of the manufacturer's specified maximum pressure. While we recommend that maximum pressure not exceed 550 mm Hg, many units are designed to allow higher pressures. [Because the Kidde Model 400 maximum cuff pressure is so high (greater than 900 mm Hg), there is little point in measuring it.]
CRITERION: #550 mm Hg or ±50 mm of Mfr Spec

CONTROLLER STABILITY: When testing pressure indicator accuracy, observe each pressure reading for 2 min to verify that the pressure remains stable. Because experience indicates that the Kidde Model 400 may develop a valve leak that permits excess reservoir pressure into the cuff, verify the stability of this controller. Using the same setup as in the Maximum Cuff Pressure test, adjust the gauge/meter pressure to 400 mm Hg from 0 mm Hg. [Perform this test in conjunction with the Elapsed Time Meter/Timer test.]
CRITERION: 400 ±10 mm Hg over 15 min

ELAPSED-TIME METER/TIMER: Verify the accuracy of a timing mechanism, where present, using a stopwatch or a watch with a second hand for a period of 15 min.
CRITERION: ±2 min for Period of 15 min

CUFF PRESSURE INDICATOR ACCURACY: With the controller still connected to the pressure gauge or meter, verify indicator accuracy at settings of 200 and 450 mm Hg. Observe each pressure reading for 2 min.
CRITERION: 5% at 200 and 450 mm Hg

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IPM Form for Pneumatic Tourniquets (Major)

Work Order No.: _____ Location: _____ Control No: _____

Manufacturer: _____ Model: _____ Serial: _____

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TEST APPARATUS REQUIRED

☐ Leakage Current Meter/Safety Analy
☐ Ground Resistance Ohmmeter
☐ Pressure Meter, $1,000 mm Hg
☐ Stopwatch or Watch with Second Hand
☐ Hoses, T Fittings, and Adapters
☐ Sphygmo Squeeze Bulb w/Bleed Valve

SUPPLIES REQUIRED

☐ Cylindrical Object to Simulate Arm

QUALITATIVE TASKS

☐ Chassis/Housing	☐ Motor/Pump
☐ Mount/Fasteners	☐ Battery/Charger
☐ Casters/Brakes	☐ Indicators/Displays
☐ Line Cord	☐ Alarms
☐ Strain Reliefs	☐ Audible Signals
☐ Circuit Breaker/Fuse	☐ Labeling
☐ Tubes/Hoses	☐ Pressure Cuffs
☐ Fittings/Connectors	☐ Dual-Bladder Control Valve
☐ Controls/Switches	

PREVENTIVE MAINTENANCE

☐ Clean Exterior and Accessories	☐ Calibrate
☐ Lubricate	☐ Replace Deteriorated Components

QUANTITATIVE TASKS					
Task Description/Criterion	**Set**	**Indicd**	**Measured**	**Pass** T	**Fail** T
Grounding Resistance #0.5 Ω					
Chassis Leakage Current #100 μA					
Maximum Cuff Pressure #550 mm Hg or ±50 mm of Mfr Spec					
Controller Stability 400 ±10 mm Hg over 15 min					
Elapsed-Time Meter/Timer ±2 min for Period of 15 min					
Cuff Pressure Indicator Accuracy 5% at 200 and 450 mm Hg					

SUMMARY

☐ Service Required ☐ Removed from Use ☐ Acceptable for Use

Completed by:	Date	IPM Time	Repair Time